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| Accessing the real part of the forward elastic quarkonium -- proton scattering amplitude close to threshold |
| 17th May 2019 |
| 2:15 pm |
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| Abstract |
| We provide an updated analysis of the forward $J/\psi$-p scattering amplitude, relating its imaginary part to $\gamma p\to J/\psi p$ and $\gamma p\to c\bar cX$ cross section data, and calculating its real part through a once-subtracted dispersion relation. From a global fit to both differential and total cross section data, we extract a value for the spin-averaged $J/\psi$-p s-wave scattering length $a\_{\psi p}=0.046\pm0.005$~fm, which can be translated into a $J/\psi$ binding energy in nuclear matter $B\_\psi=2.7\pm0.3$~MeV. We estimate the forward-backward asymmetry to the $\gamma p\to e^-e^+p$ process around the $J/\psi$ resonance, which results from interchanging the leptons in the interference between the $J/\psi$ production and the Bethe-Heitler mechanisms. We show that this asymmetry can reach values around -25\%. Its measurement can thus provide a very sensitive observable for a refined extraction of $a\_{\psi p}$. The suitable kinematics were investigated for the specific setup of HMS and SHMS detectors of Hall C at Jefferson Lab (USA). A corresponding analogous study may be conducted for the $\phi$ case, where compared to the $J/\psi$ case, the threshold energy is smaller and the cross section is larger. We also show a preliminary investigation of the similar opportunity to extract the $\Upsilon$-p scattering length, based on an expected future photoproduction data from the Electron-Ion Collider.  |